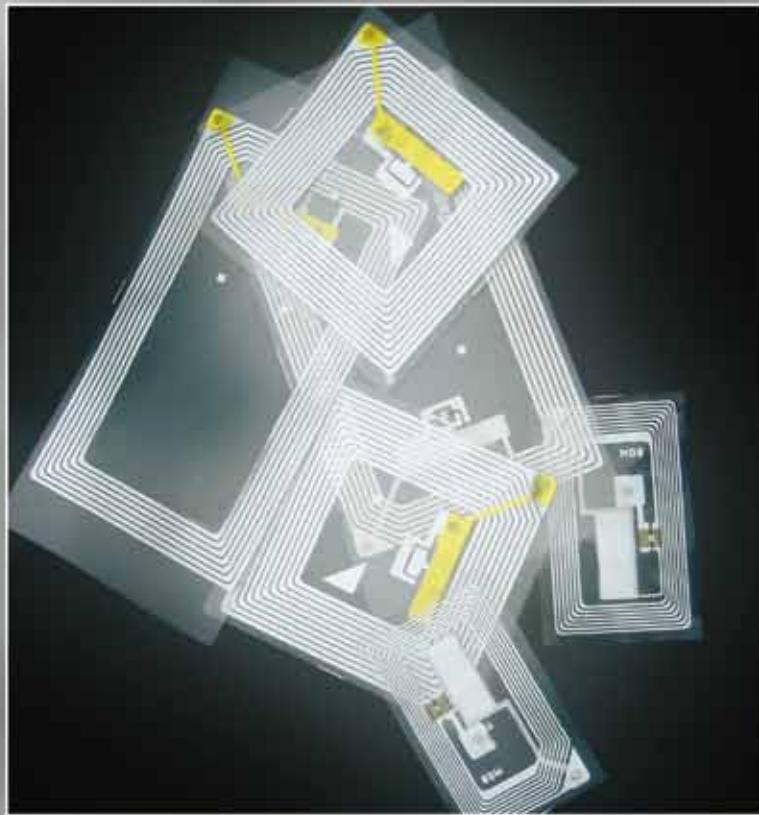


# Radio Frequency Identification

The Future is Now!

T. Michael Johnson

*[Note: Mention of industry organizations in this article does not constitute endorsement by the Department of Defense.]*



Most radio frequency identification (RFID) tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio frequency signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal.

---

**Johnson** is an acquisition program manager for E-3 AWACS aircraft. He previously worked as an equipment specialist and life cycle logistics specialist.

The Department of Defense mandated that active and passive tags are required to:

- Provide near-real-time visibility of certain classes of supplies and material in transit
- Provide information as to the content and data included in the container
- Provide nonintrusive identification
- Enhance item visibility.

The goal is to make the supply chain visibility fully automated, thereby reducing both human error and manhours required to deliver the right materials to the right user at the right time. Active tags will be used for large freight containers for visibility during transit. Once the container has reached the theater of operation, it will be unpacked. The items inside of the large shipment will contain passive tags to facilitate automated receiving and distribution.

Currently, active RFID tags are applied by DoD personnel only to large consolidated shipments that are moving from the continental United States to areas outside of the continental United States. If the volume exceeds DoD capabilities, the suppliers will be provided tags to attach to their shipments.

### **The Future Has Arrived**

Originally, DoD instituted item-unique identification and RFID for the purpose of rectifying supply chain inefficiencies and the lack of asset visibility. RFID in particular brings a hands-off data reading capability; and when linked to global positioning satellites, an active RFID tag produces real-time tracking of supplies anywhere in the world. A memorandum was issued by the acting under secretary of defense for acquisition, technology and logistics on July 30, 2004, calling for the mandatory use of RFID tags across the supply chain beginning Jan. 1, 2005. That was a great starting point for the use of this technology, but in the years since this policy took effect, the technology has been developed into much more than a capability for tracking pallets of material.

Private industry has fully embraced and continues to develop RFID technology into a tool that can do more than asset tracking and visibility. Imagination seems to be the only limiting factor of what RFID can do. The Airbus Company has fully embraced this new technology by developing and using RFID on its latest entry into the commercial airliner market—the model A380, a behemoth that can transport 555 to 835 passengers depending on its seating configuration. The A380 was designed and built with a fully integrated use of RFID technology.

Airbus deliberately planned every phase of logistics support for their new aircraft. The business plan involved three phases:

- Phase I: RFID tagging would be the enabler to fully integrate all suppliers by providing asset visibility throughout the supply chain.
- Phase II: Manufacturing processes would use RFID to not only get the right part to the right place at the right time, but would also enable automated re-ordering of consumable parts on the assembly line.
- Phase III: Maintenance processes and parts would be reviewed, and an electronic manifest to speed and improve aircraft serviceability would be built.

With all three phases completed according to the company's master plan, the first A380 was delivered on Oct. 15, 2007. The new airliner is currently flying with fully integrated RFID technology. The A380 incorporates approximately 10,000 RFID tags on board the aircraft. The tags are programmed for a wide variety of functions. One function is that time change—or time-controlled, limited-lifetime parts—have been equipped with RFID smart labels to store maintenance and inspection data. These data are transmitted via the tag's antenna without a maintenance person ever having to remove or gain access to the part being tracked. That saves time and money in maintenance hours, and simplifies components and spares management.

By using onboard computer servers, the repair and flight history of RFID-tagged components can be transmitted in electronic format while in flight. The aircraft also has a central data connection point that allows maintenance personnel to connect a laptop computer and download all system data. That allows for comprehensive tracking and accuracy of aircraft components. When coupled with in-flight data transmissions to the Airbus operations center, system failures can be transmitted in real time, allowing maintenance crews to be alerted, parts acquired, and service procedures prepared so repair work can begin as soon as the aircraft lands.

#### **RFID in DoD**

Starting out as a method of supply chain management, RFID has now expanded to include logistics and distribution, manufacturing assembly lines, and tracking of maintenance and repair process flow. RFID-enabled processes are similar to government aerospace operations, specifically Air Force Programmed Depot Maintenance facilities. Let us examine some of those process areas to see how RFID technology could be adapted to government aerospace by using what the private sector has already proven to be a viable solution.

I will use the Air Logistics Center, Tinker Air Force Base, Okla., as an example of how this new technology could be used to improve process performance and cut costs. Tinker AFB's engine maintenance facility performs repair, modifications, test, and reclamation of 14 different engine types while sustaining a supply of more than 22,000 engines for the Air Force fleet. Tinker also hosts programmed depot maintenance functions on a wide range of complex aircraft. The Air Logistics Center performs all of the same functions that Airbus and other aerospace companies perform in the private sector. Although the Air Logistics Center is the primary example, the tactics could apply to any Department of Defense center.

#### **Supply Chain/Logistics**

One example of how Tinker AFB's engine line might use RFID technology is the use of automated receipts for verifi-

cation of engines, parts, and assemblies that arrive on the loading dock. Scanners would read RFID on the shipment container, providing instant verification of what the container holds without its ever having to be opened. Zones could also be set up that would sound an alarm or initiate an e-mail if an engine container or component assembly was moved to the wrong location. This near-real-time tracking would help eliminate time wasted trying to locate a misplaced item, or an item's falling behind schedule in the repair process because it was moved to the wrong location and forgotten.

#### **Manufacturing**

During manufacturing, many consumable and non-consumable parts are kept in some form of bins. RFID tags could be used to monitor the levels of stock of those items. When an item reaches a predetermined low level, new parts would be ordered automatically, ensuring no work stoppages as a result of a lack of parts. Another way man-

ufacturing could benefit is if each component installed into an engine is scanned into a computer. The master parts list of that engine could be compared to what has been installed, ensuring no parts are forgotten during the assembly. That would lead to a higher level of quality and reduce the chances of an engine's having to be reworked. It would also lead to tighter control of scheduling, and would give real-time visibility into the work process and time required for installing and building the engine.

#### **Programmed Depot Maintenance**

The use of RFID tags and equipment gives a new method of real-time tracking of day-to-day status. This enables managers to uncover process choke points and errors before they can affect production schedules and cause a reduction in output. Installing RFID-automated tool control centers could easily address and simplify tool inventories/locations/calibration and the amount of time used for check-in/check-out procedures.

As an example, "special tools" that require periodic calibration could be set up to send an alert whenever they are about to exceed their calibration date. Inventory of a toolbox could be accomplished by the wave of a handheld scanner, which would ensure accuracy and reduce the loss of valuable time resulting from the current methods. Lost tools present a real hazard to aviation maintenance. An important safety benefit could be realized by quickly finding a missing tool on an aircraft with a scanner as opposed to a crew of workers spending hours looking for it. The scanner would inform immediately if the missing tool is even on board the aircraft, thus eliminating a potential safety hazard in minutes instead of hours.

### **Inventory Carry-On Equipment**

RFID can be used for process improvement in aerospace operations from the supply line to maintenance, and one example is using a hand scanner to inventory carry-on equipment without ever having to see or physically touch it. Expanding this idea a bit makes it easy to see how this simple method of inventory control could be adapted to all branches of the military. Military members rely on inventories of one form or another. Some items are critical to missions and can easily be tagged and scanned, such as mobility items, weapons, vehicles, and almost anything else that would require item accountability. The time saved by automated logging and inventory of these items could reap huge benefits. This ability could improve rapid-response missions by decreasing logistics timelines.

### **The Possibilities are Boundless**

The use of RFID tags is limited to one's imagination and the amount of data or programming that the tag can hold. A perfect example of using one's imagination with RFID is in-flight meals. RFID-coded instructions on each frozen meal can tell the oven what temperature and how long the item should be cooked to come out perfect every time. RFID technology continues to grow and become more powerful, and it is also gaining acceptance across a diverse set of users—and that is lowering the cost of the technology both for hardware and for software and making the return-on-investment timeline decrease as the price of this new technology continues to drop.

DoD jumped on the RFID bandwagon early but needs to continue to invest in the technology. In the constant search for better ways to save tax dollars and improve processes, RFID shows the promise of being able to help all of DoD accomplish this difficult task.

To learn more about RFID, I suggest you read the *RFID Journal* at <[www.rfidjournal.com](http://www.rfidjournal.com)>.

---

The author welcomes comments and questions and can be contacted at [todd.m.johnson@tinker.af.mil](mailto:todd.m.johnson@tinker.af.mil).

## **A Six-pack of Tips for Defense AT&L Authors**



**1** Look at back issues of the magazine. If we printed an article on a particular topic a couple of issues ago, we're unlikely to print another for a while—unless it offers brand new information or a different point of view.

**2** We look on articles much more favorably if they follow our author guidelines on format, length, and presentation. You'll find them at <[www.dau.mil/pubs/dam/DAT&L%20author%20guidelines.pdf](http://www.dau.mil/pubs/dam/DAT&L%20author%20guidelines.pdf)>.

**3** Number the pages in your manuscript and put your name on every page. It makes our life so much easier if we happen to drop a stack of papers and your article's among them.

**4** Do avoid acronyms as far as possible, but if you must use them, define them—every single one, however obvious you think it is. We get testy if we have to keep going to acronym finder.com, especially when we discover 10 equally applicable possibilities for one acronym.

**5** Fax the Certification as a Work of the U.S. Government form when you e-mail your article because we can't review your manuscript until we have the release. Download it at <[www.dau.mil/pubs/dam/DAT&L%20certification.pdf](http://www.dau.mil/pubs/dam/DAT&L%20certification.pdf)>. Please don't make us chase you down for it. And please fill it out completely, even if you've written for us before.

**6** We'll acknowledge receipt of your submission within three or four days and e-mail you a publication decision in four to five weeks. No need to remind us. We really will. Scout's honor.